

Interproximal caries assessment decision making and treatment among dental students and practitioners in Saudi Arabia

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ABSTRACT

Aim: This study aims to assess the knowledge and perception of dental students and practitioners. Moreover, to assess their restorative threshold, restorative technique, and knowledge of the materials used to treat interproximal caries in Saudi Arabia. **Materials and Methods:** A cross sectional study, directing dental students and practitioners in Saudi Arabia (n=400). Survey was conducted using an online questionnaire taken from Practice-Based Research Networks; it was distributed on Social Media platforms (Twitter, Snapchat and WhatsApp) for a period of 5 weeks, the study duration was between October and November 2019. Data analysis was done using (IBM-SPSS, Armonk) version 25. Ethical approval was obtained prior to survey distribution (ethical approval code: RC/IRB/2019/271). **Results:** Carious lesions reaching the [dentinoenamel junction (DEJ)] reported divergent treatment approaches in comparison to enamel caries. 40.8% suggested minimal intervention using [preventive resin restoration (PRR)], while 24.5% chose fluoride application and follow up rather than intervention and restoration placement. **Conclusion:** Decision making in restorative treatment of interproximal carious lesions showed noticeable variation depending on caries reaching the DEJ and at the surface of enamel. Cutting into lesions with radiolucency at the outer third of dentin seems to be the treatment of choice among dentists in Saudi Arabia.

Keywords: Dentinoenamel junction; Dental materials; Interproximal caries; Minimal invasive dentistry; Treatment plan.

1. INTRODUCTION

Dental diagnosis is considered to be a subjective matter that is greatly affected by the dentists' own opinion, philosophy and previous experience (Mejàre et al., 1999). Diagnosis and risk assessment are considered to be the backbone of decision making process along with patients' preference. A number of diagnostic tools and guidelines have been developed over the years to



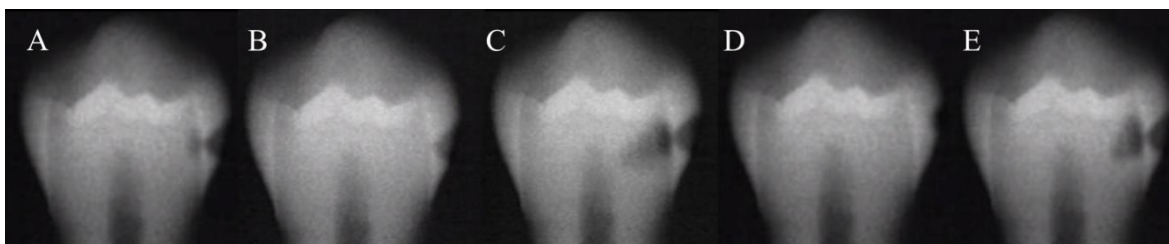
monitor dental caries detection, progression and point of restorative intervention (Gomez et al., 2014). However, the conventional bitewing radiographs are known to be the most reliable method for detecting interproximal caries (Pitts, 1983). Nowadays, dentistry is leaning towards a more conservative treatments rather than restorative approaches. For that reason, surgical intervention on non-cavitated enamel caries is improper (Kakudate et al., 2012). In a previous study regarding surgical intervention of proximal caries, results showed that decision making was greatly affected by patients' risk assessment. Dentists tend to suggest a more aggressive treatment with high caries risk patient than low-risk patients (Kakudate et al., 2012). On the other hand, some studies showed diagnostic variations both with the same tooth to one dentist at different times; and between two different dentists around the same time (Heaven et al., 2013). Another research comparing surgical intervention of proximal caries at different countries concluded that surgical threshold varies among populations (Kakudate et al., 2012). This study aims to assess the knowledge and perception of dental students and practitioners. Moreover, to assess their restorative threshold, restorative technique, and knowledge of the materials used to treat interproximal caries in Saudi Arabia.

2. MATERIALS AND METHODS

The cross-sectional study was designed in a questionnaire format intended for dental students during their pre-clinical and clinical years, interns, general practitioners and post-graduates (n=400). The questionnaire was taken from Dentists in Practice-Based Research Networks "DPBRN" that engages dental practitioners in studies aiming to improve their clinical practice. Approval was maintained from DPBRN committee to use their questionnaire for research purposes. The study was approved by the research center at Riyadh Elm University (ethical approval code: RC/IRB/2019/271).

This article displays the Interproximal Caries Assessment Decision Making and Treatment Among Dental Students and Practitioners in Saudi Arabia based on questions from the DPBRN "Study 1: Assessment of Caries Diagnosis and Treatment" questionnaire, https://www.nationaldentalpbrn.org/wp-content/uploads/2020/05/Letter.and_p-i-specific.summary.results.sent_in_advance.of_meeting1.pdf (The National Dental Practice-Based Research Network, 2006).

Participants selected their treatment of choice from a list of procedures in response to five different scenarios presented as radiographic images of interproximal caries located in mandibular premolars at varying depths along with a brief description of the patient dental status. Figure 1 contains the radiographs alongside the question format. Cases A, E, and C presented radiolucency's in the outer, middle and inner thirds of dentin sequentially. Case B showed a radiolucency reaching the inner half of enamel whereas Case D showed a radiolucency in the outer half of enamel.



Reprinted from DPBRN questionnaire, page 10, section 6

Figure 1 the patient is 30-year old female, medically fit, she has no dental restorations, no dental caries and no missing teeth. Cases A, E, and C presented radiolucency's in the outer, middle and inner thirds of dentin respectively, where as Case B and D had radiolucency reaching the inner and outer half of enamel sequentially.

Study Population

This study required the participation of dental students and practitioners from Saudi Arabia. Distribution of the questionnaire was via social media platforms (Twitter, WhatsApp, Snapchat) for a period of 5 weeks, the study duration was between October and November 2019. Targeted population included dental students on pre-clinical and clinical years, dental interns, general practitioners and post-graduates. Furthermore, dental students were sub-categorized into 3rd, 4th, 5th and 6th year of clinical practice. Regions of distribution included central, western and eastern regions of Saudi Arabia.

Variable Selection

To discover relations of listed variables for the objective of this study, gender, age, region, university, and educational level information were collected. Age's significance is contained in estimating the influence of the practitioners' years of experience in the detection and treatment of proximal caries in a future study.

Statistical analysis

Descriptive statistics of frequency distribution and percentages were calculated for the characteristics of the study participants and preferences towards treating proximal carious lesions. The relationship between preferences towards treatment of proximal carious lesions and characteristics (gender, region and type of university) of the study participants was assessed by applying Fisher's exact test. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant. All the statistical analysis performed by using (IBM-SPSS, Armonk) version 25.

3. RESULTS

Questionnaires were sent out to all ($n=600$) eligible undergraduate dental students, dental interns, post-graduates and general dentists and 400 (80%) were completed and submitted; whereas (20%) did not respond; therefore, sample sizes differ in some instances. Among the participants who participate, there was a slight difference between gender, age group variations, regions, universities and education level (Table 1), having more female participants (71.8%) than male participants. Whereas the highest age group participating was between 20-29 (90%), and regarding the regions in Saudi Arabia, central region participants were the highest (87.3%).

Figure 2 summarizes the treatment approach among different interventions given to each case. Only 2.3% of dentists would restore restoratively when the lesion was still in the outer one-half of enamel (Case D), but most dentists preferred to go with fluoride application and follow up 62.8%; while about 20% went oral hygiene instructions. A significant difference ($p=0.009$) was observed between male and female participants with regards to the treatment preference of proximal carious lesion in Case D.

We analysed for the interaction among the decision to cut into enamel lesions (combining Cases B and D) or dentin lesions (joining Cases A, C, and E) and the study's explanatory variables. Case A presented with a radiolucency reaching the outer third of dentin, showed that 72.3% would interfere surgically (drill and fill), while only 19.3% chose minimal drilling and preventive resin restoration (PRR) as their line of treatment. Case B had a bit of a controversy between participants, as it is presented with a lesion reaching the dentino-enamel junction (DEJ) and responses were relatively close to each other as 40.8% suggested minimal intervention and PRR, while 24.5% proposed fluoride application and follow up rather than surgical intervention. Case C and E having carious lesions at the inner and middle third of dentin, respectively. Almost all dentists 97.3% and 94.8% had agreed on surgical intervention, respectively. However, gender, region and type of university did not show any significant relationship towards treatment preferences of proximal carious lesions in all the cases.

Table 1 Characteristics of the study participants			
Characteristics		N	%
Gender	Female	287	71.8
	Male	113	28.2
	Total	400	100.0
Age	Below 20	6	1.5
	20-29	360	90.0
	30-39	25	6.3
	40-49	9	2.3
	Total	400	100.0
Region	Central	349	87.3
	Western	22	5.5
	Eastern	29	7.2
	Total	400	100.0
University	Government	111	27.9
	Private	269	67.2
	Others	20	5.0

	Total	400	100.0
Education	Preclinical	27	6.8
	Undergraduate clinical	229	57.3
	Dental intern	75	18.8
	General practitioner	37	9.3
	Postgraduate	32	8.0
	Total	400	100.0
If undergraduate	3 rd year	19	4.8
	4 th year	32	8.0
	5 th year	66	16.5
	6 th year	135	33.8
	None	148	37.0
	Total	400	100.0

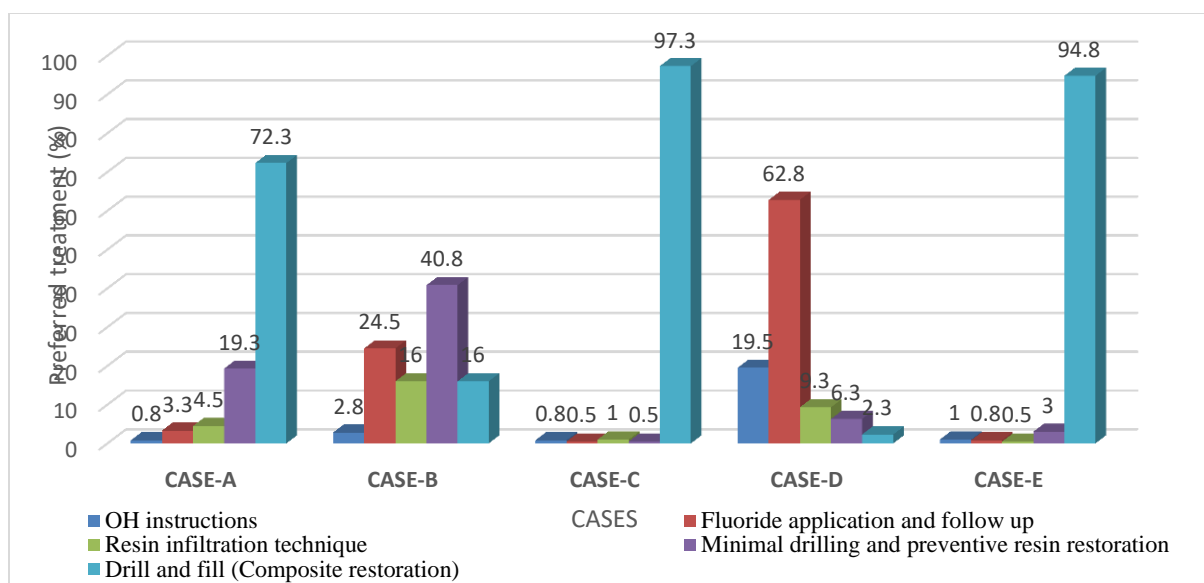


Figure 2 summarizes the treatment approach among different interventions given to each case.

4. DISCUSSION

Dental intervention of enamel caries has been a conflict among dentists and dental organizations around the world (Gordan et al., 2009). Recent guidelines regarding interference of enamel caries states that “prevention should be initiated in advance of any surgical procedure is done (Gordan et al., 2009)”. Currently, non-cavitated enamel and dentin caries are treated via remineralization rather than conventional drill and fill restorations (Gordan et al., 2009). However, a systemic review and meta-analysis by Dr. Innes and Schwendicke (2017) reported that beyond half of the dentists would drill and fill lesions reaching DEJ while most of them are not cavitated and could be prevented with minimal intervention methods (Innes and Schwendicke, 2017). Surface cavitation has a leading role in treatment decision (Schwendicke et al., 2018), hence it’s a drawback of this particular study as it only assess radiographic interpretation of carious lesions. Unfortunately, there is no apparent relation between radiographic appearance and presence of cavitation (Urzúa et al., 2019). The use of low cost elastic bands to separate adjacent teeth and attain visual and tactile access to proximal surfaces is considered sufficient and of a great diagnostic benefit (Urzúa et al., 2019).

The depth of caries was shuffled between shallow carious lesions and deep caries to assure participants’ attentive response that is not affected by any patterns. The majority of dentists and students tend to interfere surgically (drill and fill) when radiolucency is

reaching the outer third of dentin (Case A). Many dentists view DEJ as a critical point of intervention, and that any point either at or past DEJ is requiring surgical treatment (Khalaf et al., 2014). A similar study done in Kuwait, results showed that Kuwaiti dentists would postpone restorative intervention till the caries have reached dentin. Moreover, dentists at the same study reported more conservative restorative approach in terms of preparation in occlusal caries in contrast to proximal preparations. However, in our study there was a minority that would choose minimal drilling and PRR as their line of treatment for outer third of dentin lesions (Khalaf et al., 2014).

Generally speaking, a lesion reaching the DEJ has had the highest variation in participants' point of view, as it is presented with relatively close response percentage (Case B). A higher number leaned towards a minimal intervention (PRR) approach, while almost one third proposed fluoride application and follow up rather than surgical intervention. In a similar study that was conducted in Scandinavian regions concluded that dentists do not interfere in such lesions and suggested that lesions follow up is sufficient. This has a strong relation to the preventive and recall policy in such countries that is more predictable and adequately promoted among the public (Gordan et al., 2009). Similarly, in Norway, the fact of caries' slow progression contributed in the decision of postponing the restorative intervention until penetration is reaching the first third of dentin (Vidnes-Kopperud et al., 2011).

Cariou lesion the inner third of dentin resulted in dentists' agreement of surgical intervention (Case C) as the cariological behaviour of bacteria is unstoppable or reversible which requires surgical intervention and restoration placement. Moreover, carious lesions that are confined to the outer surface of enamel require either oral hygiene instructions or fluoride application and follow up, and no restorative interventions what soever (Case D). Caries risk plays an important role in practitioners' decision making. They tend to suggest more invasive treatment with high risk patients (Gordan et al., 2009). Because of the fact that dental caries is a multifactorial disease that is not confined to restoration placement, patients' education and caries assessment is a crucial aspect of treatment (Gordan et al., 2009). A study regarding caries management reported that dentists who treat each lesion as a separate unit tend to be more invasive and contribute to unnecessary removal of sound tooth structure (Gordan et al., 2009; Urzúa et al., 2019).

5. CONCLUSION

Decision making in restorative treatment of interproximal carious lesions showed significant variation depending on caries reaching the DEJ and at the surface of enamel. Drilling in lesions with radiolucency at the outer third of dentin appears to be the treatment of choice among dentists in Saudi Arabia. Nowadays, dentistry is leaning towards conservative treatments rather than restorative approaches, and more high-tech diagnostic transilluminating, fluorescence and laser tools.

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Author contribution

All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

Conflict of Interest

There are no conflicts of interest.

Funding

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Ethical approval

The study was approved by the research center at Riyadh Elm University (ethical approval code: RC/IRB/2019/271).

Data availability

All data associated with this study are present in the paper.

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